

WHAT IS CLAIMED IS:

1. A method of processing a data signal, comprising the steps of:
acquiring a data signal by an acquisition unit of a test instrument for a
predetermined time;
5 storing said data signal in a memory of said test instrument;
recovering a clock signal from said stored data signal; and
slicing said stored data signal into a plurality of data segments of a predetermined
length in accordance with said recovered clock signal.
2. The method of processing a data signal of claim 1, wherein said clock
10 recovery step further comprises the steps of:
defining a threshold level relative to said stored data signal;
comparing each portion of the stored data signal to said threshold level;
determining pairs of adjacent samples that straddle said threshold; and
estimating a time of crossing said threshold between said adjacent samples to
15 obtain a series of observed times of threshold crossing.
3. The method of processing a data signal of claim 2, wherein said threshold
is defined as an absolute value.
4. The method of processing a data signal of claim 2, wherein said threshold
is defined as a percentage of said recorded data signal's amplitude.
- 20 5. The method of processing a data signal of claim 2, further comprising the
step of considering a hysteresis requirement to confirm that a determined pair of adjacent
samples that straddle said threshold should be included as part of said series of observed
times of threshold crossing.
6. The method of processing a data signal of claim 2, wherein each said time
25 of crossing of said threshold is estimated based upon a linear interpolation.
7. The method of processing a data signal of claim 2, wherein each said time
of crossing of said threshold is estimated based upon a non-linear interpolation.
8. The method of processing a data signal of claim 2, wherein said series of
observed times of threshold crossing is used to obtain a recovered virtual periodic clock.

30

9. The method of processing of claim 8, said clock recovery step further comprising the steps of:

comparing said series of observed times of threshold crossing to an ideal periodic sequence of expected times of threshold crossing comprising said recovered virtual

5 periodic clock;

determining an error between said observed times and said expected times; and

adjusting the phase of said recovered virtual periodic clock in accordance with said determined error.

10 10. The method of processing of claim 8, said clock recovery step further comprising the steps of:

comparing each element of said series of observed times of threshold crossing to each element of an ideal substantially periodic sequence of expected times of threshold crossing;

15 determining the error between each observed time and the corresponding expected time, and;

based upon each error and preceding errors, adjusting the instantaneous phase of the substantially periodic sequence of times of threshold crossing according to mathematical algorithms thus obtaining a specified dynamic response for the recovered substantially periodic clock.

20

11. The method of processing said data signal of claim 8, further comprising the steps of:

determining the absence of one or more transitions of said data signal;

locating a position of a next transition of said data signal;

25 associating said located next transition of said data signal with a closest expected time of threshold crossing of said recovered virtual periodic clock.

12. The method of processing said data signal of claim 8, further comprising the step of determining a number of expected times of threshold crossing that have passed between two transitions of said data signal between which an absence of one or
30 more transitions has been determined.

13. The method of processing said data signal of claim 8, wherein said expected transition times are determined in accordance with calculations employing floating point numbers.

14. The method of processing a data signal of claim 1, wherein the step of
5 recovering said clock signal further comprises the steps of:
estimating a frequency of said recovered clock; and
discarding a predetermined number of predicted times of threshold crossings of said data segments until said recovered clock settles to a substantially periodic frequency.

15. The method of processing a data signal of claim 1, wherein said step of
10 recovering said clock signal further comprises the steps of:
detecting a predetermined number of transitions of threshold crossings of said data segments;
revising an initial phase of said recovered clock signal to give a mean time-error of zero for said predetermined number of transitions; and
15 restarting processing.

16. The method of processing a data signal of claim 15, wherein said recovered clock signal is made substantially perfectly periodic.

17. A method for displaying an eye diagram, comprising the steps of:
acquiring a data signal by an acquisition unit of a test instrument for a
20 predetermined time;
storing said data signal in a memory of said test instrument;
recovering a clock signal from said stored data signal;
slicing said stored data signal into a plurality of data segments of a predetermined length in accordance with said recovered clock signal; and
25 overlaying said plurality of data segments on a display in a time synchronized manner.

18. The method of displaying an eye diagram of claim 17, further comprising the step of repeating said steps to acquire and display a second acquired data signal along with said first-mentioned data signal.

19. The method for displaying an eye diagram of claim 18, wherein said first and second data signal acquisitions are displayed after inter symbol interference processing.

20. The method for displaying an eye diagram of claim 18, wherein said first and second data signal acquisitions are displayed after the data segments associated therewith are mathematically processed.

21. The method of processing a data signal of claim 17, wherein said clock recovery step further comprises the steps of:

defining a vertical threshold relative to said stored data signal;
comparing each portion of the stored data signal to said vertical threshold;
determining pairs of adjacent samples that straddle said vertical threshold; and
estimating a time of crossing said vertical threshold between said adjacent samples to obtain a series of observed times of threshold crossing.

22. A method for implementing a mask violation locator, comprising the steps of:

acquiring a data signal by an acquisition unit of a test instrument for a predetermined time;
storing said data signal in a memory of said test instrument;
recovering a clock signal from said stored data signal;
slicing said stored data signal into a plurality of data segments of a predetermined length in accordance with said recovered clock signal;
overlaying said plurality of data segments on a display in a time synchronized manner to generate an eye diagram;
defining a portion of said display to constitute said mask; and
determining whether one or more of said data segments violates said mask.

23. The method of claim 22, wherein said clock recovery step further comprises the steps of:

defining a vertical threshold relative to said stored data signal;
comparing each portion of the stored data signal to said vertical threshold;
determining pairs of adjacent samples that straddle said threshold; and

estimating a time of crossing said threshold between said adjacent samples to generate a series of expected times of threshold crossing.

24. The method for implementing a mask violation locator of claim 22, wherein said first acquired data signal is discarded, but indications of any bits that
5 violated said mask are retained upon acquisition of said second data signal.

25. The method of claim 24, wherein when it is determined that one of said data segments violates said mask, displaying a portion of said stored data signal including a portion thereof used to generate said data segment that violates said mask.

26. The method of claim 24, wherein when it is determined a plurality of said
10 data segments violate said mask, further comprising the steps of:

storing a data segment identifier corresponding to each of said data segments determined to violate said mask; and

displaying, consecutively for each data segment corresponding to each data segment identifier, that portion of said stored data signal used to generate each of said
15 data segments that violates said mask.